

Section 10

Economic, Land Use & Archaeology Impacts, Preventative & Management Measures



10. Economic, Land Use & Archaeology Impacts, Preventative & Management Measures

10.1 Introduction

This section provides a description and assessment of the potential impacts on local economies and land use as a result of the TTP. Appropriate preventive and management measures that will be implemented to reduce impacts to an acceptable level are discussed. Both positive and negative impacts have the potential to materialise as a result of the TTP.

The potential negative impacts include:

- disturbance to archaeological and cultural heritage sites;
- changes and restrictions to land use;
- pressure on utilities, transport networks, infrastructure and services.

Potential positive impacts include:

- creation of direct and indirect employment opportunities during the construction phase;
- the conversion from fuel oil to gas at Gove will deliver further air quality and greenhouse gas improvements;
- enhanced revenue streams into the local and Northern Territory economies;
- opportunities for local, regional and Indigenous businesses.

10.2 Land Tenure and Land Use

Impacts

A description of the land tenure and land use through which the proposed TTP route will traverse is presented in **Section 7.2.1** and **Section 7.2.2**.

Agricultural, Pastoral and Cattle Stations: Potential impacts on these areas could include:

- Permanent loss of land associated with the presence of some newly established permanent access roads and above ground facilities.
- Temporary loss of potential crop growing areas associated with the construction footprint.
- Temporary disturbance to stock and loss of feedstock along the construction corridor during pipeline construction.
- Degraded land due to poor reinstatement and waste management practices.
- Restriction on excavation and building on land directly above the buried pipeline.
- Restriction on planting of deep-rooted vegetation above the buried pipeline.

Given the short time period associated with pipeline construction, the remoteness of the route and low population density only minimal short term impacts are expected. Furthermore, only a very

small proportion of the route crosses agricultural land. The cattle and pastoral stations affected by the TTP are large properties and hence the area of land that will be temporarily disrupted is relatively small.

Impacts during operation will be limited to the presence of above ground facilities, and intermittent pipeline inspection and maintenance operations which will involve occasional visits to the pipeline. Only deep rooted vegetation will not be permitted to be planted above the pipeline, low impact vegetation will be allowed; however, no commercial forestry can be grown along the proposed construction corridor. Impacts during operation are therefore considered negligible.

Mining: There will be no impacts on the only existing mining area (Alcan's bauxite mine) as potential mining areas have been avoided. In the event that other mining tenements are developed in the future, the primary potential impact that may occur is the sterilisation of mineral reserves within the pipeline licence area, which may result in loss of revenue.

Aboriginal Land: Potential impacts on Aboriginal Land use include:

- Temporary loss of access during construction.
- Providing unintentional third party access.
- Prohibition of shooting in the vicinity of compressor stations.
- Temporary and permanent loss of habitat for species of current traditional usage.
- Introduction of weed and vermin species into previously pest free areas.
- Restriction on excavation and building on land directly above the buried pipeline.
- Restriction on planting of deep-rooted vegetation above the buried pipeline.

The range of impacts on Aboriginal land are expected to be minimal, given the small amount of land to be used, in comparison to the size of the Aboriginal estates. Nonetheless, the proponent is in negotiations with the NLC, on behalf of traditional Aboriginal owners to make agreements and arrangements, which will mitigate any negative impacts and optimise any potential positive impacts. Strategies will be cooperatively developed from implementation during construction and operation, which will see traditional Aboriginal owners integrally involved in land management on Aboriginal land.

Preventative and Management Measures

A range of preventative measures will be implemented to ensure that impacts to land tenure and land use are reduced to acceptable levels, including:

- Clearance for construction will not commence until all relevant agreements are in place with landowners in accordance with Northern Territory legislation and TTP project requirements.
- The pipeline will be buried and is not likely to result in any long term disturbance to existing land use practices.
- Permanent access roads will be minimised to approximately 4 m wide to accommodate access for operations and maintenance.

In addition, management measures will be implemented to reduce potential impacts on existing land use practises and these will include:

- Ongoing consultation with landowners to provide information on the project and how the TTP will be constructed in a manner that will minimise disruptions to landowners.
- Access to all areas will be strictly controlled to avoid unauthorised and inappropriate access.
- Approvals will be obtained for any additional land requirements outside the pipeline construction corridor or corridor, prior to construction activities commencing.
- The construction corridor and construction areas will be pegged to avoid unauthorised clearing and access.
- During construction areas where stock are present along the pipeline construction corridor may be fenced, and if required small sections of the trench will remain unexcavated to allow for stock movements and mustering.
- The construction corridor will be rehabilitated as soon as practicable.
- During operation the above ground facilities will be protected by fencing to prevent stock entering and to restrict third party access.

Environmental Management Plans that will be implemented to ensure management measures are undertaken in a coordinated manner will include:

- Traffic Management Plan which will specify designated access routes.
- Waste Management Plan which will specify clean up measures along the construction corridor and all other construction sites.
- Rehabilitation Management Plan which will specify procedures for effective restoration.
- Social Impact Management Plan.

10.3 Protected Areas

Impacts

Indigenous Protected Areas: Environmental disturbance during the construction and to a lesser extent during operation of the pipeline will potentially impact on the natural and cultural values of Dhimurru IPA and the proposed Laynhapuy IPA. Clearing of the pipeline corridor, excavation of the pipeline trench, construction and use of the access tracks and construction and use of the construction camps will involve the removal of animals and plants and other disturbance of biodiversity values. Much of this disturbance is expected to be short-term as the corridor will be rehabilitated and native vegetation will be allowed regrow, with the exception of large trees which will not be allowed to re-establish over the pipeline.

National Parks and Nature Reserves: The proposed TTP route will not directly intersect any existing or proposed government-managed conservation reserves or national parks (**Figure 7-3**). The nearest government managed protected area to the proposed route is Cutta Cutta Caves Nature

Reserve, located approximately 4 km away. Potential impacts are considered negligible, given that no construction or operation activities will encroach on these areas.

Preventative and Management Measures

Indigenous Protected Areas: The potential impacts of the pipeline on the values of Dhimurru IPA and the proposed Laynhapuy IPA will be addressed as part of the process of assessing and protecting Aboriginal environmental cultural values along the length of the pipeline (**Section 7.7.2**), particularly through the development of CHMPs in collaboration with traditional Aboriginal owners. Measures within the CHMP to protect biodiversity and other environmental values along the length of the pipeline will contribute to the protection of natural values within the IPAs.

Other Protected Areas: The proposed TTP route has been designed to specifically avoid protected areas, including national parks and conservation reserves. Potential impacts associated with off-road driving will be managed through the development and implementation of a Traffic Management Plan and Vegetation Clearing Management Plan.

10.4 Wilderness Areas

Impacts

The pipeline route will traverse two designated wilderness areas as well as the edges of other wilderness areas (**Section 7–4**). Following construction the TTP will have a negligible effect on wilderness values as potential impacts are likely to be limited to the physical presence of above ground facilities. There are existing minor tracks within most of the wilderness areas intersected by the pipeline and it is unlikely that the presence of the access tracks for maintenance and inspection purposes will create any impacts on wilderness values.

Preventative and Management Measures

Other than in areas where above ground facilities will be located, the pipeline will be buried. Following construction the corridor will be quickly revegetated with ground cover and the permanent access tracks will be infrequently used. A **Rehabilitation Management Plan** will be developed and implemented. The nature of the landscape and land use within these areas will not be changed, therefore it is expected that the pipeline will have no long term impact on wilderness areas.

10.5 Tourism and Recreational Areas

Impacts

It is expected that the impact of the TTP on tourism in the Top End will be minimal for the following reasons:

- Most of the route traverses land which either requires permits, or permissions for entry, or is otherwise not a significant part of the tourism value of the Northern Territory.

- Road access to regional centres such as Katherine will not be blocked during construction of the pipeline.
- Personnel will be transported in and out of the work areas on a rotational basis from regional centres including Nhulunbuy, Katherine, Wadeye and Darwin.

It is anticipated that very few personnel will remain in the centres, although there may also be some controlled recreational activity by these personnel during the construction periods. There may be some demand for accommodation in these regional centres, but accommodation for construction personnel will otherwise be provided in designated construction camps along the route.

Preventative and Management Measures

Preventative and management measures will be implemented to ensure that the TTP has minimal impact on tourism and include:

- All personnel working on the pipeline within areas of Aboriginal Land will have the appropriate permits from the Northern Land Council.
- Road access to tourist spots will be maintained open at all times.
- Construction personnel will be accommodated in construction camps, away from regional centres, with the exception of a camp that may be located at Katherine.

10.6 Archaeology and Historic Heritage

Impacts

Impacts on archaeological and historic heritage values were managed during the design phase by avoiding direct impacts on archaeological and heritage sites protected under Commonwealth and Northern Territory legislation. The proposed pipeline alignment was moved to avoid archaeological sites attributed with a high significance as discussed in the technical report in **Appendix L, Volume 2** of this Draft EIS. The archaeological and historic sites that are located nearby or within the 100 m pipeline corridor will be vulnerable to disturbance during construction. The potential impacts on these sites are discussed below. The discussion does not include sites that may occur along access tracks to the project area as these were being surveyed at the time this document was being prepared. The potential impacts of access tracks on archaeological and historic heritage values will be minimised by using existing tracks where possible and appropriate site protection and management measures will be implemented where required.

Sites Vulnerable to Disturbance: Of the 40 archaeological or historic sites identified during the field surveys, 31 are situated within one kilometre of the proposed pipeline corridor. While sites located over 150 m from the pipeline centreline are highly unlikely to be affected by the development, there are uncertainties in evaluating any impacts to sites within 150 m due to precision in location. The potential for impacts is highest within 50 m of the pipeline centreline, where sites could be damaged or destroyed during construction. Sites located within the 100 m pipeline corridor are considered to be vulnerable to disturbance (**Table 10-2**), and sites located

between 100 m and 150 m from the pipeline may be at risk of inadvertent disturbance during construction (**Table 10-1**).

■ **Table 10-1 Archaeological and Historic Sites Potentially at Risk of Disturbance**

Nearest KP	Site No.	Metres from Centreline	Site Type	Significance
260	13	105	Stone artefact scatter	Moderate
266	14	145	Quarry	Low–Moderate
317	17	110	Quarry	Moderate–High
324	15	130	Historic Manbulloo Airstrip	High
642	26	140	Stone artefact scatter	Moderate

Forty-three of the 84 background scatters identified during the survey are located within the pipeline corridor and therefore will be vulnerable to inadvertent disturbance during construction activities. These are background scatter numbers 11, 12, 18, 21, 24–26, 28–30, 33–39, 41–43, 45–47, 49, 50, 54, 55, 58, 59, 61–64, 66, 67, 69, 73, 74, 76–79 and 83. The locations of these scatters are identified in **Appendix L, Volume 2**.

In summary, there are two archaeological sites and two historic sites located within 50 m of the pipeline centreline that may be destroyed during construction in the absence of appropriate protective measures. There are a further six sites located within the 100 m pipeline corridor that will be vulnerable to disturbance. Five archaeological sites and 84 background scatters that occur within 150 m of the pipeline centreline may be at risk of inadvertent disturbance during construction. All of these sites, whether they are of high or low significance, are protected under the *NT Heritage Conservation Act 1991*. Specific management and mitigation measures which will be implemented to prevent impacts on archaeological and historic sites, and to ensure compliance with the Act, are described below.

Previously Unrecorded Archaeological Sites and Objects: Previously unrecorded archaeological sites and objects, which are also protected under the *Northern Territory Heritage Conservation Act 1991*, may be inadvertently disturbed during construction. However, the risk of inadvertent disturbance of sites will be greatly reduced through a more complete archaeological survey of sections of the corridor identified as having a high archaeological potential prior to any ground disturbance. There are several long sections of the pipeline corridor where the potential for locating archaeological material is very low as the terrain consists of featureless plains and very few creek crossings or other landscape features (**Table 10-3**). For the remaining approximately 720 km of the pipeline corridor there is a high potential that previously unrecorded sites will be present. These sites will be at risk of disturbance in the absence of appropriate measures to identify their presence and prevent impacts.

Sites in close proximity will be at risk if erosion and sedimentation occurs as a result of construction and operation activities, will be closely monitored and controlled.

■ **Table 10-2 Archaeological and Historic Sites Vulnerable to Disturbance**

Nearest KP	Site No.	Metres from Centreline	Site Type	Significance	Vulnerability to Disturbance*	Preventative and Management Measures During Construction
217	36	75	Stone artefact scatter	Mod to High	Vulnerable	Site to be fenced off, clearly signed and access prohibited to project personnel.
266	16	86	Stone artefact scatter	Low	Unlikely - artefact scatter on the Daly River. Use of HDD to cross the river will avoid this site.	None required
325	18	20	Stone artefact scatter	Low	Highly vulnerable	Site to be fenced off, as above
347	20	50	Stone artefact scatter	Mod	Vulnerable	Site to be fenced off, as above
354	21	30	Stone artefact scatter	Low	Highly vulnerable	Site to be fenced off, as above
358	22	80	Stone artefact scatter	Low	Vulnerable	Site to be fenced off, as above
366	23	0	Historic North Australian Railway	Low to Mod	Highly Vulnerable - remains of the North Australian Railway line. As the pipeline cannot avoid crossing the line, 30 metres of the line will be destroyed.	Permit to destroy Construction corridor fenced, clearly marked and access to site outside corridor prohibited
597	29	50	Stone artefact scatter	Low	Unlikely - site is situated half way up a very steep hill and the pipeline is located at the base of the hill.	None required
642	27	60	Stone artefact scatter	Mod	Vulnerable	Site to be fenced off, as above
642	28	20	Stone artefact scatter	Low	Highly vulnerable	Site to be fenced off, as above
661	5	60	Stone artefact scatter	Mod to High	Vulnerable	Site to be fenced off, as above
827	24	60	Stone artefact scatter	Low	Vulnerable	Site to be fenced off, as above
*Vulnerability to Disturbance Vulnerable = Sites within 100 m pipeline corridor Highly Vulnerable = Sites within 50 m of pipeline centreline Unlikely = Sites protected from disturbance but within 100 m corridor.						

This page has been left intentionally blank

■ **Table 10-3 Sections of Pipeline Corridor with Low Archaeological Potential**

Region	KP Start–End	Distance (km)
Ord-Vic	162–213	51
Tipperary	218–259	41
Tipperary	267–309	42
A/Land	601–641	40
A/Land	701–782	50

Preventative and Management Measures

A Cultural Heritage Management Plan (CHMP) will be developed to collate all preventative and management measures that will be implemented to protect archaeological and historic heritage values. A framework for the CHMP is provided in **Section 12**.

Site specific mitigation actions will be implemented at sites identified in **Table 10-1** that will be vulnerable to disturbance during construction. The specific actions that will be implemented to protect these sites will be determined by an archaeologist once the actual location of the 30 m wide construction corridor is delineated on the ground and the proximity of the sites to construction activities is confirmed. The 30 m corridor will be delineated in consultation with an archaeologist and traditional Aboriginal owners. Sites with moderate to high archaeological significance will be given various levels of protection, possibly including temporary fencing, clear marking and prohibited access of the site during construction, and restrictions on work within a certain distance from the site. Measures that may be required are identified in **Table 10-1**.

Where it is determined that it is not feasible to protect archaeological and heritage sites, consent to disturb the sites will be sought from the Minister for Lands, Planning and the Environment under sections 29 and 39 of the *Heritage Conservation Act 1991*. This may apply to the 43 recorded background scatters that occur within the pipeline corridor. Salvage of some sites may be required. This work will be undertaken where deemed necessary by the Office of Environment and Heritage.

In order to minimise the potential impacts on previously unrecorded sites and objects, further archaeological surveys will be conducted along sections of the pipeline corridor with high archaeological potential. These surveys will be undertaken at the time the pipeline alignment is surveyed and will verify which sites will be destroyed or disturbed as well as recording previously unidentified archaeological material. Areas that have a very low archaeological potential are identified in **Table 10-3**. During construction a response mechanism will be set up to minimise damage to previously unrecorded archaeological material that is inadvertently disturbed, including unsurveyed areas. The response may need to include the cessation of work around the archaeological material, and will include obtaining advice from the regulatory authority to ensure that the conditions of the *Northern Territory Heritage Conservation Act 1991* are not contravened. The proponent will seek an approved process with the Office of Environment and Heritage to manage this process efficiently.

During the operational phase, on-going protection of the all sites in the vicinity of the pipeline alignment will be required. The stability of some of the sites will be particularly vulnerable to unauthorised visits and interference. In order to minimise these potential impacts, the exact locations of archaeological material will not be made available to employees who will be working in the field. Areas of prohibited entry will be delineated instead. The potential for impacts on archaeological and/or historic sites will be assessed prior to undertaking maintenance activities.

Management Summary

- A Cultural Heritage Management Plan (CHMP) will be developed.
- Archaeological surveys will be undertaken during pegging of all project areas that have high archaeological potential.
- Archaeological sites with moderate to high significance that occur within 150 m of project areas will be afforded appropriate protection from disturbance.
- Archaeological sites with moderate to high significance that cannot be afforded protection will be managed in accordance with the requirements of the statutory authority.
- Consent to disturb sites of low archaeological significance that occur in the project area will be sought from the statutory authority.
- Where the pipeline corridor traverses the Northern Australian Railway heritage site the construction corridor will be fenced, clearly marked and access outside of the corridor will be prohibited.
- Mitigation and reporting measures will be developed to deal with any inadvertent disturbance of previously unrecorded sites and sub-surface archaeological materials.
- Construction and operation personnel will be thoroughly informed on prohibited areas, and rules and disciplinary measures will apply where breaches occur.
- Construction and operation personnel will undertake cross-cultural awareness training to ensure positive and effective inter-cultural communication.
- An Erosion and Sediment Control Management Plan will be developed and implemented (**Section 12**).
- Potential for impacts on archaeological and historic sites will be assessed prior to conduct of maintenance activities.

10.7 Aboriginal Sites of Significance

Impacts

Potential impacts to Aboriginal sites of significance are mainly confined to the construction phase of the project. However, operations personnel and visitors to site will also be fully informed of the restriction pertaining to the sites at induction. Potential impacts may include:

- Disturbance to Aboriginal sacred sites through off-road driving, sourcing of fill or raw materials and through exploration of the area surrounding the pipeline development by the construction workforce.

- Inappropriate access by the construction and operation workforces.

The potential impacts on Aboriginal sites of significance as a result of the TTP are expected to be minimal as great care has been taken to avoid disturbance to any sites during the planning and site selection stage of the project. Discussions with traditional Aboriginal owners and anthropological surveys were undertaken and the proposed pipeline development work areas have been selected to avoid areas of current traditional usage and where sacred sites or objects may exist. .

Preventative and Management Measures

The following preventative and management measures to mitigate potential impacts on Aboriginal cultural sites will be implemented:

- A CHMP will be developed in consultation with the NLC and traditional Aboriginal owners. This plan will incorporate procedures to raise the awareness of the workforce of Aboriginal land issues and the associated legal and project requirements.
- Where necessary, traditional Aboriginal owners will be employed as monitors during construction activities.
- Disturbance of areas of current traditional usage will be kept to a minimum during construction and management plans will be put in place where this is necessary.
- The construction workforces will be thoroughly informed on prohibited areas, and rules and disciplinary measures will apply where breaches occur.
- Construction and operation personnel will undertake cross-cultural awareness training to ensure positive and effective inter-cultural communication.

In summary, potential impacts to Aboriginal cultural sites will be minimised through the implementation of agreed management measures with the NLC and traditional Aboriginal owners.

10.8 Aboriginal Environmental Cultural Values

Impacts

Disturbance of animals, plants, habitats, rivers and waterholes during the construction and operation of the pipeline, if not managed correctly, has the potential to impact on Aboriginal cultural values associated with these environmental attributes. The application of the methodology for assessing Aboriginal environmental cultural values (**Section 7.7.2**) will clarify the extent of the potential impact of particular values within each clan estate and hence guide the development of measures to avoid or minimise those impacts.

Preventative and Management Measures

All measures to avoid or minimise disturbance of animals, plants, habitats, rivers and waterholes during route selection, which has been completed with traditional Aboriginal owner involvement, and other specific actions in the CHMP will assist in reducing the impact on Aboriginal environmental cultural values.

Specific preventative and management measures designed to protect Aboriginal environmental cultural values will be incorporated into the CHMP developed in Phase 2 of the methodology outlined in **Section 7.7.2**, in collaboration with traditional Aboriginal owners, prior to the construction of the pipeline. CHMP will include specific actions to avoid or minimise impact on species and habitats of high cultural significance during the construction and operation of the pipeline, particularly through route selection but also through other management actions.

Rehabilitation of the pipeline corridor, including the return of native vegetation and control of weeds will also have the effect of supporting the cultural values associated with these ecosystems. The involvement of traditional Aboriginal owners in environmental rehabilitation, weed control, pipeline monitoring, track maintenance etc. will facilitate continued connection to their Traditional Country, providing opportunities to maintain their cultural values associated with that Country.

10.9 Transport Network and Infrastructure

Impacts

Transport Network: Various routes and options are currently under consideration for transporting raw materials, personnel and equipment to construction areas (including road, rail and sea). The significance of impacts on existing transport infrastructure will therefore depend upon the transportation method selected. Once the final modes of transport have been selected, preventative and management measures will be developed accordingly and incorporated into the Traffic Management Plan. Impacts on modes of transport and facilities other than road for example rail, port and air are not expected to be significant.

Significant impacts on transport infrastructure in particular the existing road network will be experienced during the construction period. During construction, traffic will be intense as materials, pipe sections and personnel are transported to site along main roads, and also between the construction camps and along the construction corridor. Transport routes will include existing roads and newly created access roads. Existing users are likely to experience a notable increase in traffic volumes, particularly in more remote areas as a result of project related traffic.

Large lengths of the pipeline route are sufficiently far away from human habitation and major roads for the effects to go largely unnoticed. However, in populated areas, such as Katherine and isolated communities through which access roads will pass, there is the potential for elevated noise and dust levels and associated nuisance (**Section 9.6**). However, the duration of these activities will be short and the effects temporary.

In summary, disruption to roads users and the environment during construction could potentially arise due to:

- increased construction traffic, including large pipe trucks, along main roads and through rural townships;
- construction of pipeline crossings at roads and railway lines;
- localised traffic congestion;

- wide loads.

As well as disruption to road users, other adverse impacts may include:

- incidental creation of an 'unofficial highway' to rural and Aboriginal areas along the construction corridor;
- deterioration of road integrity;
- increased noise and dust emissions due to increased traffic.

Infrastructure: Other transport infrastructure that may be potentially impacted during construction activities includes:

- *Rail and Pipelines:* Both the Alice Springs - Darwin railway and the Amadeus Basin to Darwin Gas Pipeline will be crossed (**Table 5-11**). There will also be a temporary increase in rail freight during the pre-construction period if line pipe is transported to construction areas from Wollongong, New South Wales or south from Darwin.
- *Air:* During construction, inter-state workforce will fly-in and fly-out of the Northern Territory as part of crew rotation and leave entitlements. This is likely to result in increased demand and/or competition for air services operating out of the Territory. Airports at Wadeye, Darwin, Katherine/Tindal and Nhulunbuy will most likely be affected and may result in the need for increased services.
- *Accommodation and Services:* The large increase in population in the vicinity of Nhulunbuy and Katherine during construction will create additional demands on existing infrastructure, but this is likely to be limited, as workers will be housed in temporary camps. Despite construction workforce accommodation being provided, hotel and caravan park accommodation is expected to be in high demand for housing of contractors and suppliers to the TTP. This will have positive impacts on the local economy.

During operations there is limited scope for impacts to infrastructure given that vehicular movements by operations and maintenance personnel will be minimal and that housing will most likely be at Katherine and Nhulunbuy. Occasional visits to the MLV and scraper station facilities for maintenance will be required.

Preventative and Management Measures

Further assessment of the impacts on transport infrastructure will be undertaken once all of the access routes have been confirmed and approved. Once this has been achieved, appropriate preventative and management measures will be developed and incorporated into Traffic Management Plans.

The major impact to the condition of the construction corridor will be from the pipe trucks; the ground will be turned into corrugations and bulldust, and will require continuous maintenance. This will pose a hazard to other construction traffic and slow the stringing operations down.

Several road maintenance gangs will be required to ensure the roads are trafficable to the pipeline and all other traffic.

Disruption to local traffic and damage to roads can be managed through implementation of the following traffic preventative measures:

- Prior to significant use a joint assessment of road conditions by TTP and the road authorities will take place for all roads approved for use by the project.
- Infrastructure upgrades will be undertaken where required prior to commencement of construction in consultation with relevant local government departments, landowners and regulatory authorities.
- Consultation will be undertaken with traditional Aboriginal owners during the preparation of the Traffic Management Plans to develop measures to ensure access to rural areas during construction and operation will be by authorised personnel only, to prevent the construction corridor developing into an 'unofficial highway'.
- Transport routes and storage areas will be planned in consultation with regulatory authorities to minimise disruption to residents.
- New access routes will avoid environmentally and culturally sensitive areas.
- The construction corridor will be used in preference to tracks where high road maintenance is anticipated, such as sand and soft soil.

A Traffic Management Plan will be implemented which will specify measures to manage traffic including:

- Designation of approved access routes.
- Speed restrictions - a speed limit of 60 km/hr along the pipeline corridor and 5 km/hr when passing personnel.
- Granting of appropriate licenses and permits for transport of large loads obtained prior to construction.
- Truck movements on the pipeline corridor and access tracks will take place during daylight hours. In the event that no other option is viable, access arrangements will be made with landowners and in accordance with local regulatory requirements for night traffic.

Preventative and management measures that will be implemented at crossing locations to ensure disruption to traffic and the public will be minimised will include:

- Road crossings will be constructed as quickly and safely as possible.
- All four sealed road crossings and also the Melville Bay Road on the Alcan Gove lease will be horizontally bored to minimise traffic disruption and damage to the road surface.
- Unsealed roads will be open-cut. However, bypasses or steel plates will be used to maintain traffic flow at all times.

- The use of multiple-person vehicles and full occupancy for travel to and from worksites will be encouraged.

On completion of pipeline installation the following management measures will be implemented:

- Ongoing maintenance will take place during the construction period as well as at the end of construction.
- As soon as practicable roads will be returned to the agreed pre-construction condition.
- Access tracks that are not designated for permanent use will be reinstated in accordance with a Rehabilitation Management Plan, unless an alternative agreement has been reached with landowners. Otherwise, tracks will be maintained as required for operations.

10.10 Utilities

Impacts

The TTP will require use of existing utility systems, which will mainly be confined to the construction and commissioning periods. This has the potential to create additional pressure on the capacity of existing utilities. For example, potable water may be extracted from watercourses, wells or bores (either existing or new), and treated, or trucked in from the nearest existing source. Either of these options has the potential to adversely affect existing water supply and local usage. Pressure on existing waste handling facilities will depend on the size and capacity of these facilities and will be more pronounced for smaller, rural and remote facilities located away from populated areas. The key potential impacts on existing utilities include:

- Draw down of aquifers due to water extraction from bores used by local communities and landowners.
- Increased pressure on existing local solid waste handling reception facilities.
- Damage to electrical or telecommunication cables and the existing pipelines (for example NT Gas Pipeline).

Preventative and Management Measures

Preventative measures will include:

- TTP contractors will consult with local authorities regarding access to existing utilities and usage requirements prior to construction.
- Overhead powerlines and buried cables will be identified prior to construction.
- The pipeline will be bored below the existing Northern Territory Gas Pipeline so there will be no disruption to pipeline operation.
- A Groundwater and Surface Water Protection Management Plan will be implemented (**Section 12**). As part of the plan, a groundwater resource sustainability assessment will be undertaken following identification of the preferred water supply options. This study will determine project demand, existing capacity and potential risk to resources.

- A Waste Management Plan will be implemented to identify appropriate waste handling facilities and confirm expected waste volumes (**Section 12**).

10.11 Economic Environment

The TTP will bring a range of positive economic benefits to the local area, the Northern Territory and Australia in general. Key benefits that may potentially arise include:

- the creation of employment opportunities;
- increased business opportunities;
- benefits to the Australian and Northern Territory economies including increase in capital expenditure, Northern Territory GDP and GSP, household income;
- indirect or flow-on benefits.

Positive impacts could potentially be most significant and prevalent during the construction period. The routing of the pipeline through some of the more remote and least economically developed areas of the Northern Territory will potentially bring opportunities for Indigenous communities.

ACIL Tasman (2004) carried out an economic impact assessment for the TTP. The following section summarises the key findings from this document.

10.11.1 Employment Benefit

Impact

Employment will be generated during the construction phase, potentially peaking to approximately 800 personnel. During operation, the TTP is expected to directly employ between 20-30 personnel each year. The impact on employment opportunities in the Northern Territory during operation is likely to be minimal. However, it is expected that all workers during operation could be sourced from and based in the Northern Territory.

Business participation and employment policies will be developed to include preferences for employment of people from local areas and the Northern Territory. Where possible, emphasis will be placed on maximising the employment of local Indigenous people.

10.11.2 Increased Business Opportunities

Impact

There are good opportunities for Northern Territory businesses to be involved in the TTP during both the construction and operation phases of the TTP. Examples of these opportunities can be summarised as, but not limited to:

- site preparation and revegetation;
- providing accommodation;
- maintenance of the pipeline route;
- airline services;

- pipeline coating;
- pipeline maintenance;
- security.

Whilst many businesses that can provide these services already exist in the Northern Territory, there are also opportunities for new business development.

Preventative and Management Measures

Opportunities exist for participation by Northern Territory based businesses and Territorians. Businesses need to recognise these opportunities and prepare themselves to participate in the procurement process.

10.11.3 Benefits to the Australian and Northern Territory Economies

Impacts

Gross Domestic and Gross State Product: The construction phase of the TTP is expected to add an average of \$18 million per annum to the Northern Territory's real GSP. During the operation phase, the TTP is expected to add an average of approximately \$29 million in each year of operation to the real GSP of the Northern Territory.

Government Revenues: The TTP will make a significant contribution to government revenues, particularly Commonwealth revenues. The Net Present Value (NPV) of Commonwealth and Territory Government revenues from the TTP is estimated to be around \$75 million. In an average year over the life of the TTP, governments can therefore expect to derive around \$4.5 million a year (in current dollar terms) in taxation revenues from shareholders and employees.

Capital Expenditure: Capital costs associated with construction of the TTP are estimated to be around \$550 million with 20% of this having a Northern Territory content, 75% rest of Australia content and a 5% imported content. During operation of the TTP, the impact on the Northern Territory economy in terms of capital expenditure is not expected to be significant.

10.11.4 Indigenous Communities

Impacts

The remote location of the TTP provides an opportunity for Indigenous business development or employment of Indigenous people who live close to the pipeline. Examples include the provision of services such as maintenance of the pipeline construction corridor and access tracks. There will be opportunities for skilled work, such as road maintenance and general maintenance including repairs to equipment and infrastructure. There may also be opportunities in revegetation of construction sites, advice on suitable plants for revegetation and monitoring of rehabilitation.

There are also opportunities to capture the skills developed during the construction phase of the TTP. As demonstrated with Alice Springs–Darwin Railway, personnel that have been trained and

employed in site preparation and construction are well positioned to apply for similar opportunities in new developments that require these or similar skills.

Preventative and Management Measures

Where possible, emphasis will be placed on optimising the utilisation of the local Indigenous population.

10.12 Summary of Potential Impacts

Table 10-4 summarises the potential impacts, both positive and negative, to the economic and land use environment.

■ **Table 10-4 Summary of Potential Impacts**

Resource/ Receptor	Source	Potential Impact	Preventative and Management Measures
Land Tenure and Land Use (Section 10.2)	Presence of construction crew, vehicles and machinery and construction footprint. Presence of permanent access road and above ground facilities.	Permanent loss of land associated with the presence of some newly established permanent access roads and above ground facilities. Temporary loss of potential crop growing areas associated with the construction footprint. Temporary disturbance to stock and loss of feedstock along construction corridor during pipeline construction. Degraded land due to poor reinstatement and waste management practices. Restriction on excavation and building on land directly above the buried pipeline. Restriction on planting of deep-rooted vegetation above the buried pipeline. There will be no impacts on the only existing mining area (Alcan's bauxite mine) as potential mining areas have been avoided. In the event that mining tenements are developed in the future, the primary potential impact that may occur is the sterilisation of mineral reserves within the pipeline licence area, which may result in loss of revenue. Temporary loss of access during construction. Providing unintentional third party access. Prohibition of shooting in the vicinity of compressor stations. Temporary and permanent loss of habitat for species of current traditional usage. Introduction of weed and vermin species into previously pest free areas.	Clearance for construction will not commence until all relevant agreements are in place with landowners in accordance with Northern Territory legislation and TTP project requirements. The pipeline will be buried and is not likely to result in any long term disturbance to existing land use practices. Permanent access roads will be minimised to approximately 4 m wide to accommodate access for operations and maintenance vehicles. Ongoing consultation with landowners to provide information on the project and how the TTP will be constructed in a manner that will minimise disruption to landowners. Access to all areas will be strictly controlled to avoid unauthorised and inappropriate access. Approvals will be obtained for any additional land requirements outside the pipeline construction corridor or corridor, prior to construction activities commencing. The construction corridor and construction areas will be pegged to avoid unauthorised clearing and access. A Traffic Management Plan will be developed and implemented which will specify designated access routes (Table 12-7). A Waste Management Plan will be developed and implemented which will specify clean up measures along the construction corridor and all other construction sites (Table 12-2). A Rehabilitation Management Plan will be developed and implemented which will specify procedures for effective restoration (Table 12-13). A Social Impact Management Plan will be developed and implemented (Table 12-18).
Protected Areas (Section 10.3)	Construction traffic.	The nearest protected area is located approximately 4 km away from the pipeline route. Potential impacts are considered negligible.	During the preliminary design phase, alternative routes which directly transected through national parks and conservation areas were discarded. Potential impacts associated with off-road driving will be managed through the development and implementation of a Traffic Management Plan (Table 12-7). A Vegetation Clearing Management Plan will be developed and implemented (Table 12-9).
Wilderness Areas (Section 10.4)	Presence of permanent access road and above ground facilities.	Temporary and long term disturbance to wilderness areas.	The construction corridor will be revegetated with ground cover through the development and implementation of a Rehabilitation Management Plan (Table 12-13). The nature of the landscape and land use within these areas will not be changed.
Tourism and Recreational Areas (Section 10.5)	Road construction and construction traffic. Survey and construction personnel.	Temporary disturbance to roads connecting to areas with tourist value. Temporary excess demand for accommodation in regional centres. Survey and construction personnel recreating in regional centres or on Aboriginal Land.	All personnel working on the pipeline within areas of Aboriginal Land will have the appropriate permits from the Northern Land Council. Construction personnel will be accommodated in construction camps, away from regional centres, with the exception of a camp that may be located at Katherine. Road access to tourist spots will be maintained open at all times.

Resource/ Receptor	Source	Potential Impact	Preventative and Management Measures
Archaeology (Section 10.6)	HDD, surveying. Clearing of vegetation, pipeline trenching. All site works. Vehicle, plant and equipment movements. Rehabilitation works.	Destruction of or damage to archaeological and cultural material.	Archaeologists will be available to attend the pegging of the pipeline corridor and alignment. Archaeological surveys will be undertaken during pegging of all project areas that have high archaeological potential. Archaeologists will be available to attend site preparation works and excavations. Archaeologists will be available at short notice for all works to assess potential sites and report to Office of Environment & Heritage. Archaeological sites with moderate to high significance that occur within 150 m of project areas will be afforded appropriate protection from disturbance during construction. Archaeological sites with moderate to high significance that cannot be afforded protection will be dealt with in accordance with the requirements of the statutory authority. Consent to disturb sites of low archaeological significance that occur in the project area will be sought from the statutory authority. Where the pipeline corridor traverses the Northern Australian Railway heritage site the construction corridor will be fenced, clearly marked and access outside of the corridor will be prohibited. Mitigation and reporting measures will be developed to deal with any inadvertent disturbance of previously unrecorded sites and subsurface archaeological materials. Project personnel will be thoroughly informed of prohibited areas, and rules and disciplinary measures will apply where breaches occur. Construction and operation personnel will undertake cross-cultural awareness training to ensure positive and effective inter-cultural communication. Potential for impacts on archaeological and historic sites will be assessed prior to conduct of maintenance activities. An Erosion and Sediment Control Management Plan will be developed (Table 12-15). A Cultural Heritage Management Plan will be prepared to address protection and management of archaeological and other cultural heritage matters (Table 12-17).
Aboriginal Sites of Significance (Section 10.7)	HDD, surveying. Clearing of vegetation, pipeline trenching. All site works. Vehicle, plant and equipment movements. Rehabilitation works.	Disturbance to Aboriginal sacred sites through off-road driving, sourcing of fill or raw materials and through exploration of the area surrounding the pipeline development by the construction workforce. Inappropriate access by the construction and operation workforces.	A Cultural Heritage Management Plan will be developed (Table 12-17). Where necessary traditional Aboriginal owners will be employed as monitors during development/construction activities. Disturbance of areas of current traditional usage will be kept to a minimum during construction and management plans will be put in place where this is necessary. Construction and operational personnel will be thoroughly informed of prohibited areas, and rules and disciplinary measures will apply where breaches occur. Construction and operation personnel will undertake cross-cultural awareness training to ensure positive and effective inter-cultural communication.
Aboriginal Environmental Cultural Values (Section 10.8).	Environmental disturbance during the construction and operation of the pipeline.	Aboriginal environmental cultural values (including hunting, gathering, other cultural resource uses and the broader relationships between Aboriginal people and their environment) may be impacted by the environmental disturbance, particularly during the pipeline construction.	A methodology has been developed to assess and protect Aboriginal environmental cultural values, in collaboration with traditional Aboriginal owners, the broader Aboriginal community and key Indigenous organisations and technical experts. Specific measures to avoid or minimise impacts on Aboriginal environmental cultural values will be incorporated into Cultural Heritage Management Plans.

Resource/ Receptor	Source	Potential Impact	Preventative and Management Measures
Infrastructure and Transport (Section 10.9)	Increased construction traffic, including large pipe trucks, along main roads and through rural through townships. Construction of pipeline crossings at roads and railway lines. Localised traffic congestion. Night traffic and wide loads.	Incidental creation of an 'unofficial highway' to rural and Aboriginal areas along the construction corridor. Deterioration of road integrity. Increased noise and dust emissions due to increased traffic. Increased pressure on existing air services and accommodation services.	Prior to significant use a joint assessment of road conditions by TTP and the road authorities will take place for all roads intended to be used by the project. Infrastructure upgrades will be undertaken where required prior to commencement of construction in consultation with relevant local government departments, landowners and regulatory authorities. Consultation will be undertaken with traditional Aboriginal owners during the preparation of the Traffic Management Plans to develop measures to ensure access to rural areas during construction and operation will be by authorised personnel only, to prevent the construction corridor developing into an 'unofficial highway'. Transport routes and storage areas will be planned in consultation with regulatory authorities to minimise disruption to residents. New access routes will avoid environmentally sensitive areas. The construction corridor will be used in preference to tracks where high road maintenance is anticipated. Access routes not identified for permanent use during operations will be reinstated, unless an arrangement is made with landowners. Otherwise, tracks will be maintained as required for operations. Ongoing maintenance will take place during construction and at the end of construction. A Traffic Management Plan will be developed specifying speed limits (Table 12-7).
Utilities (Section 10.10)	Water abstraction from bores used by local communities and landowners. Waste disposal during Pipeline construction. Construction of pipeline crossings.	Draw down of aquifers and hence bores used by local communities and landowners. Increased pressure on existing local solid waste handling reception facilities. Damage to electrical cables and rupture of existing pipelines (for example Northern Territory Gas Pipeline).	TTP contractors will consult with local authorities regarding access to existing utilities and usage requirements prior to construction. Overhead powerlines and buried cables will be identified prior to construction. The pipeline will be bored below the existing Northern Territory Gas Pipeline to avoid disruption to pipeline operation. A Groundwater and Surface Water Protection Management Plan will be implemented (Table 12-16). As part of the plan, a groundwater resource sustainability assessment will be undertaken following identification of the preferred water supply options. This study will determine project demand, existing capacity and potential risk to resources. A Waste Management Plan will be implemented to identify appropriate waste handling facilities and confirm expected waste volumes (Table 12-2).
Economic Environment (Section 10.11)	Construction and operational phases.	Potential impacts are likely to be positive. A wide range of economic benefits from the TTP will potentially be delivered to the local area, the Northern Territory and Australia, including: - employment benefits; - business opportunities; - benefits on the Australian and Northern Territory economies; - indirect or flow-on benefits.	Opportunities exist for participation by Northern Territory based businesses and local Territorians. Where possible, emphasis will be placed on optimising the utilisation of the local Indigenous population.

This page has been left intentionally blank